NOSB NATIONAL LIST
FILE CHECKLIST

CROPS

MATERIAL NAME: **#3 Calcium chloride**

✓ **NOSB Database Form**

✓ **References**

✓ **MSDS (or equivalent)**

✓ **TAP Reviews from:** **Brian Baker, Walter Jeffery, Diana Tracy**

NOSB/NATIONAL LIST
COMMENT FORM
CROPS

Material Name: #3 Calcium chloride

Please use this page to write down comments, questions, and your anticipated vote(s).

COMMENTS/QUESTIONS:

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1. In my opinion, this material is:
_____ Synthetic _____ Non-synthetic.

2. This material should be placed on the proposed National List as:
_____Prohibited Natural _____Allowed Synthetic.

TAP REVIEWER COMMENT FORM for USDA/NOSB

Use this page or an equivalent to write down comments and summarize your evaluation regarding the data presented in the file of this potential National List material. Complete both sides of page. Attach additional sheets if you wish.

This file is due back to us by: Aug. 5 1996

Name of Material: Calcium Chloride

Reviewer Name: BART HALL

Is this substance Synthetic or non-synthetic? Explain (if appropriate) Too hard to tell — may be either

If synthetic, how is the material made? (please answer here if our database form is blank)

Therefore, it should be prohibited as an agricultural amendment.

This material should be added to the National List as:

___ Synthetic Allowed ✓ Prohibited Natural

or, ___ Non-synthetic (This material does not belong on National List)

Are there any use restrictions or limitations that should be placed on this material on the National List?

I cannot comment on the material for food processing

Please comment on the accuracy of the information in the file:

Any additional comments? (attachments welcomed)

Should not be considered 'non-agricultural', since Calcium 25 is a foliar ag product based on $CaCl_2$.

Do you have a commercial interest in this material? ___ Yes; ✓ No

Signature Barton M. Hall **Date** 96.08.06

Please address the 7 criteria in the Organic Foods Production Act:
(comment in those areas you feel are applicable)

(1) the potential of such substances for detrimental chemical interactions with other materials used in organic farming systems;

Probably none.

(2) the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment;

Decomposes into hydrochloric acid

(3) the probability of environmental contamination during manufacture, use, misuse or disposal of such substance;

(4) the effect of the substance on human health;

(5) the effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;

In field agriculture: ag limestone, gypsum

(6) the alternatives to using the substance in terms of practices or other available materials; and

(7) its compatibility with a system of sustainable agriculture.

High solubility, high salinity, hydrochloric acid breakdown, generally incompatible

TAP REVIEWER COMMENT FORM for USDA/NOSB

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This file is due back to us by: Aug. 5 1996

Name of Material: Calcium Chloride

Reviewer Name: H. RIEDL

Is this substance Synthetic or non-synthetic? Explain (if appropriate)

non-synthetic

If synthetic, how is the material made? (please answer here if our database form is blank)

This material should be added to the National List as:

____ Synthetic Allowed ____ Prohibited Natural

or, _____ Non-synthetic (This material does not belong on National List)

Are there any use restrictions or limitations that should be placed on this material on the National List?

Please comment on the accuracy of the information in the file: info OK

Any additional comments? (attachments welcomed)

warn of phytotoxicity potential

Do you have a commercial interest in this material? ____ Yes; X No

Signature Helmut Riedl **Date** Aug 9, 96

Please address the 7 criteria in the Organic Foods Production Act:
(comment in those areas you feel are applicable)

(1) the potential of such substances for detrimental chemical interactions with other materials used in organic farming systems; $CaCl_2$ has limited compatibility with other plant protection products

(2) the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment; may be phytotoxic if used in tree fruits at high rates or at high temperature

(3) the probability of environmental contamination during manufacture, use, misuse or disposal of such substance;
no threat to environment if used at recommended rates

(4) the effect of the substance on human health; low toxicity when ingested but may cause skin burns

(5) the effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;
at the recommended dosages does not pose a threat to soil organisms

(6) the alternatives to using the substance in terms of practices or other available materials; and no other alternatives (non-synth.) to correct calcium deficiencies

(7) its compatibility with a system of sustainable agriculture. is compatible

TAP REVIEWER COMMENT FORM for USDA/NOSB

Use this page or an equivalent to write down comments and summarize your evaluation regarding the data presented in the file of this potential National List material. Complete both sides of page. Attach additional sheets if you wish.

This file is due back to us by: Aug. 5 1996

Name of Material: Calcium Chloride

Reviewer Name: Brian Baker

Is this substance Synthetic or non-synthetic? Explain (if appropriate)

Mostly non-synthetic

If synthetic, how is the material made? (please answer here if our database form is blank)

This material should be added to the National List as:

____ Synthetic Allowed ____ Prohibited Natural

or, ✓ Non-synthetic (This material does not belong on National List)

Are there any use restrictions or limitations that should be placed on this material on the National List?

yes, see attached.

Please comment on the accuracy of the information in the file:

Any additional comments? (attachments welcomed)

Do you have a commercial interest in this material? ____ Yes; ____ No

Signature _____ **Date** 8/8/96

USDA/TAP Reviewer
Comment Form

Name of Material: Calcium Chloride
Reviewer Name: Brian Baker

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NATURAL
Calcium chloride is produced from naturally occurring brines, which at present are the only commercial sources in the United States.

Calcium chloride is used as a foliar source of calcium, as a post-harvest dip for apples, pear and other fruit, and applied to soil to inhibit volatilization of ammonium. It is also used as a dust suppressant. Growers have indicated that they would like to use it as a desiccant or defoliant for cotton and as an herbicide.

1. Soil application at high rates can decrease potassium uptake and induce chloride toxicity.

2. Toxicity: Oral LD_{50}=1000. Mode of action: usually as a foliar nutrient. Non-persistent; does not concentrate.

3. Extraction from brine is less destructive to the environment than the Solvay process, which it has displaced.

4. The substance is Generally Regarded as Safe for food use. NOSB has already recommended that it be allowed as a non-organic ingredient in organic food.

5. The salt index has not been calculated. See the memo on the salt index. Solubility at 20° C. is 74.5 g/100cc.

6. To correct calcium deficiencies, calcium carbonate (limestone), calcium sulfate (gypsum), calcium (rock) phosphate. Oyster, clam, crab and lobster shells as well as bone meal also contains significant calcium.

   For bitter pit diagnosed from mid-season to post-harvest, pome fruit growers have reported that calcium chloride is the only soluble non-synthetic source of calcium available as a foliar after fruit set or as a post-harvest dip. Most research on alternatives has been performed with calcium nitrate and calcium-ammonium nitrate (CAN-17), both of which are synthetic.

   To reduce ammonium volatilization of poultry manure, composting. For dust suppression: water, tall oils, lignin sulfate, magnesium chloride and sodium chloride. Planting wind-breaks and filter strips can also help with dust control. As a de-icer: magnesium chloride and sodium chloride.

   Calcium chloride's efficacy as a defoliant, desiccant and herbicide is not well documented. Non-chemical alternatives as a cotton harvest aid include water management, timing of harvest, picking more slowly, storage in trailers rather than modules and timing of ginning. Some regions (e.g. North Texas) rely on frost damage as a desiccant. Some that do not receive a killing frost rely on hand-picking (e.g. Egypt, Turkey). Chemical alternatives registered for such use include sodium chlorate, paraquat and the organophosphates DEF and Folex. Non-synthetic chemical alternatives that growers have requested be considered include sodium chloride and magnesium chloride. The NOSB has already recommended that micronutrients such as sodium tetraborate and zinc sulfate not be allowed for defoliation. Alternatives to its use as an herbicide include tillage, cover crops, hand weeding, flaming.

7. The NOSB has recommended that it be allowed as a non-organic ingredient in organic processed food. certifiers have allowed it for use as a foliar. IFOAM recommends that it be prohibited as a desiccant, defoliant and herbicide.

Recommendation: Synthetic: No. Prohibited: No.

Restrictions: Direct application to soil discouraged. To minimize biological and chemical interactions on the agroecosystem, only foliar and post-harvest uses should be permitted. Direct soil application should be discouraged for its high chloride content, with a long-term management plan to correct for documented deficiencies Use should be accompanied with a plan to correct long-term deficiencies. Use as a desiccant or herbicide should be prohibited.

TAP REVIEWER COMMENT FORM for USDA/NOSB

Use this page or an equivalent to write down comments and summarize your evaluation regarding the data presented in the file of this potential National List material. Complete both sides of page. Attach additional sheets if you wish.

This file is due back to us by: Aug. 5 1996

Name of Material: Calcium chloride

Reviewer Name: WALTER JEFFERY RECEIVED JUL 2 9 1996

Is this substance Synthetic or non-synthetic? Explain (if appropriate) Synthetic

If synthetic, how is the material made? (please answer here if our database form is blank)

This material should be added to the National List as:

____ Synthetic Allowed ____ Prohibited Natural

or, _____ Non-synthetic (This material does not belong on National List)

Are there any use restrictions or limitations that should be placed on this material on the National List?

Please comment on the accuracy of the information in the file:

Any additional comments? (attachments welcomed)

Do you have a commercial interest in this material? ____ Yes; ✓ No

Signature Walter Jeffery **Date** 7/24/96

Please address the 7 criteria in the Organic Foods Production Act:
(comment in those areas you feel are applicable)

(1) the potential of such substances for detrimental chemical interactions with other materials used in organic farming systems;

(2) the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment;

more corrosive to ~~mars~~ metals, concrete and asphalt as well as vegetation than many salts - as NaCl

(3) the probability of environmental contamination during manufacture, use, misuse or disposal of such substance;

disposal could cause problems.

(4) the effect of the substance on human health;

minimal toxic effects

(5) the effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;

High salt index

(6) the alternatives to using the substance in terms of practices or other available materials; and

(7) its compatibility with a system of sustainable agriculture.

not really

TAP REVIEWER COMMENT FORM for USDA/NOSB

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This file is due back to us by: Aug. 5 1996

Name of Material: Calcium Chloride

Reviewer Name: Diana Tracy RECEIVED AUG 0 5 1996

Is this substance Synthetic or non-synthetic? Explain (if appropriate)

If synthetic, how is the material made? (please answer here if our database form is blank)

(1) SYNTHETIC - ~~FROM~~ BY PRODUCT OF SOLVAL PROCESS

(2) NATURAL - NATURALLY OCCURING BRINES

This material should be added to the National List as:

____ Synthetic Allowed ____ Prohibited Natural

or, ____ Non-synthetic (This material does not belong on National List)

NATURAL ALLOWED

Are there any use restrictions or limitations that should be placed on this material on the National List?

SHOULD BE FROM MINED SOURCE ONLY

Please comment on the accuracy of the information in the file:

ACCURATE; NET SEARCH CORROBORATED INFO

Any additional comments? (attachments welcomed)

Do you have a commercial interest in this material? ____ Yes; X No

Signature _____ **Date** _____

Please address the 7 criteria in the Organic Foods Production Act:
(comment in those areas you feel are applicable)

(1) the potential of such substances for detrimental chemical interactions with other materials used in organic farming systems;

- OF SOME CONCERN WHEN USED AS DUST SUPPRESANT; HIGH SALT LEVELS CAN OCCUR - USE SHOULD BE REGULATED
- IMPURITIES IN TANK MIXES ~~FROM~~ CAN AFFECT pH, AND SHOULD BE WATCHED.
- USE OF DILUTE CaCl, FOR FOLIAR + POST HARVEST POSE LITTLE RISK

(2) the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment;

WATER SOLUBLE, BUT CAN CAUSE HIGH SALT CONCENTRATIONS

(3) the probability of environmental contamination during manufacture, use, misuse or disposal of such substance;

NATURAL MINED PRODUCT - THE USUAL PROBLEMS ASSOCIATED W/ MINING

~~AS~~ BYPRODUCT OF SODA ASH PROCESS - MOSTLY MINE-RELATED - PURIFICATION SEEMS PRETTY BENIGN

(4) the effect of the substance on human health;

SIMILAR TO NaCl - MODERATELY LOW HAZARD

(5) the effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;

INCREASES SALT INDEX WHEN APPLIED DIRECTLY

(6) the alternatives to using the substance in terms of practices or other available materials; and

- CROP USE: DILUTE MILK
- DUST SUPPRESSANT - WATER, LIGNIN SULFONATE, etc
- LIVESTOCK FEED - NaCl, Calcium carbonate, etc

(7) its compatibility with a system of sustainable agriculture.

COMPATIBLE

NOSB Materials Database

Identification

Common Name Calcium chloride **Chemical Name**

Other Names Calcium dichloride, Calcosan, Superflake anhydrous

Code #: CAS 10043-52-4; 10035-04-8 **Code #: Other**

N. L. Category Non-agricultural **MSDS** ◉ yes ○ no

Chemistry

Family

Composition CaCl2.2H2O. Possible impurities include lime, and chlorides of sodium, potassium and magnesium.

Properties White, hard, odorless fragments or granules. Deliquescent (absorbs water from the air). Dissolves in water and alcohol.

How Made Majority is made by concentration and purification of natural brines. Lime is added to precipitate magnesium chloride. Can also be produced as a by-product of the ammonia-soda process (the Solvay process) used to make soda ash (sodium carbonate). Sodium chloride and calcium carbonate are reacted with ammonia, producing sodium carbonate and calcium chloride. The Solvay process is no longer used in the USA.

Use/Action

Type of Use Crops

Specific Use(s) FOLIAR SPRAY IN APPLES, ETC – ~~DH~~S ALSO DUST SUPPRESSANT

Action CALCIUM SOURCE – HYGROSCOPIC

Combinations ALSO FEED ADDITIVE FOR LIVESTOCK

Status

OFPA

N. L. Restriction

EPA, FDA, etc FDA §133,§145.145, §184.1193 etc. GRAS

Directions

Safety Guidelines Can irritate or burn eyes. Inhalation of dust may irritate nose, throat or lungs.

Historical status

International status Allowed by IFOAM, EU, and Codex.

NOSB Materials Database

OFPA Criteria

2119(m)1: chemical interactions

2119(m)2: toxicity & persistence Low

2119(m)3: manufacture & disposal consequences

In high concentrations can retard plant growth. Similar to environmental impact of salt except it adds calcium to the environment instead of sodium. Brine process: all environmental impacts of brine recovery and refining. Synthetic process: all issues of chemical plants must be addressed, including: emissions, solvent containment, wastewater treatment, and instrument monitoring. Local factors play a big role in environmental impact.

2119(m)4: effect on human health

Very low in acute oral toxicity, similar to common table salt.

2119(m)5: agroecosystem biology

2119(m)6: alternatives to substance

2119(m)7: Is it compatible?

References

The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976. p. 210

Kemp, Robert and Suzanne E. Keegan, "Calcium Chloride", in: Ullmann's Encyclopedia of Industrial Chemistry, 5th Edition, Elvers, et. al. (eds.) VCH Verlagsgesellschaft mbH, Wenheim, Germany. 1992. Vol. A4. p. 547-553.

Kirk-Othmer Encyclopedia of Chemical Technology, 3rd. Ed., Volume 4, pp 432-436.

Food Chemicals Codex, 3rd Ed., National Academy Press, Washington D.C. 1981.

AU: Conway,-W.S.; Sams,-C.E.; Abbott,-J.A.; Bruton,-B.D.
TI: Postharvest calcium treatment of apple fruit to provide broad-spectrum protection against postharvest pathogens.
SO: Plant-Dis. St. Paul, Minn. : American Phytopathological Society. June 1991. v. 75 (6) p. 620-622.
CN: DNAL 1.9-P69P

Paul Schmidt, Tetra Chemical 12/22/94. (written communication)

NOSB Materials Database

Identification

Common Name Calcium chloride **Chemical Name**

Other Names Calcium dichloride, Calcosan, Superflake anhydrous

Code #: CAS 10043-52-4; 10035-04-8 **Code #: Other**

N. L. Category Non-agricultural **MSDS** ◉ yes ○ no

Chemistry

Family

Composition $CaCl_2.2H_2O$. Possible impurities include lime, and chlorides of sodium, potassium and magnesium.

Properties White, hard, odorless fragments or granules. Deliquescent (absorbs water from the air). Dissolves in water and alcohol.

How Made Majority is made by concentration and purification of natural brines. Lime is added to precipitate magnesium chloride. Can also be produced as a by-product of the ammonia-soda process (the Solvay process) used to make soda ash (sodium carbonate). Sodium chloride and calcium carbonate are reacted with ammonia, producing sodium carbonate and calcium chloride. The Solvay process is no longer used in the USA.

Use/Action

Type of Use Crops

Specific Use(s)

Action

Combinations

Status

OFPA

N. L. Restriction

EPA, FDA, etc FDA §133,§145.145, §184.1193 etc. GRAS

Directions

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NOSB Materials Database

OFPA Criteria

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2119(m)2: toxicity & persistence

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Very low in acute oral toxicity, similar to common table salt.

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2119(m)6: alternatives to substance

2119(m)7: Is it compatible?

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SO: Plant-Dis. St. Paul, Minn. : American Phytopathological Society. June 1991. v. 75 (6) p. 620-622.
CN: DNAL 1.9-P69P

Paul Schmidt, Tetra Chemical 12/22/94. (written communication)

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: CALCIUM CHLORIDE, ANHYDROUS
FORMULA: CACL2
FORMULA WT:110.99
CAS NO.: 10043-52-4
NIOSH/RTECS NO.: EV9800000
PRODUCT CODES: 1311
EFFECTIVE: 09/26/85
REVISION #01
PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM
HEALTH - 1 SLIGHT
FLAMMABILITY - 0 NONE
REACTIVITY - 0 NONE
CONTACT - 2 MODERATE
HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).
LABORATORY PROTECTIVE EQUIPMENT
SAFETY GLASSES; LAB COAT
PRECAUTIONARY LABEL STATEMENTS
STORAGE: KEEP IN TIGHTLY CLOSED CONTAINER.
SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

2 - HAZARDOUS COMPONENTS

COMPONENT%	CAS NO.
CALCIUM CHLORIDE 90-100	10043-52-4

3 - PHYSICAL DATA

BOILING POINT: N/AVAPOR PRESSURE(MM HG): N/A
MELTING POINT: 772 C (1422 F) VAPOR DENSITY(AIR=1): N/A
SPECIFIC GRAVITY: 2.15 EVAPORATION RATE: N/A
(H2O=1) (BUTYL ACETATE=1)
SOLUBILITY(H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: 0
APPEARANCE & ODOR: WHITE GRANULES.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: N/A
FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %
FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.
SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED
BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.
TOXIC GASES PRODUCED

HYDROGEN CHLORIDE

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5 - HEALTH HAZARD DATA

TOXICITY: LD50 (ORAL-RAT)(MG/KG) - 1000
LD50 (IPR-MOUSE)(MG/KG)- 280
CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO
EFFECTS OF OVEREXPOSURE
CONTACT WITH SKIN OR EYES MAY CAUSE SEVERE IRRITATION OR BURNS.
INGESTION MAY CAUSE NAUSEA AND VOMITING.
DUST MAY IRRITATE NOSE AND THROAT.
TARGET ORGANS
NONE IDENTIFIED
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED
ROUTES OF ENTRY
NONE INDICATED

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6 - REACTIVITY DATA

STABILITY: STABLEHAZARDOUS POLYMERIZATION: WILL NOT OCCUR
CONDITIONS TO AVOID: MOISTURE
INCOMPATIBLES: MOST COMMON METALS, WATER
DECOMPOSITION PRODUCTS: HYDROGEN CHLORIDE

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7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.
DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

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8 - PROTECTIVE EQUIPMENT

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION TO KEEP FUME OR DUST LEVELS AS LOW AS POSSIBLE.
RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS HIGH, USE AN APPROPRIATE RESPIRATOR OR DUST MASK.
EYE/SKIN PROTECTION: SAFETY GLASSES WITH SIDESHIELDS, UNIFORM, RUBBER GLOVES ARE RECOMMENDED.

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9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)
SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)
PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)
INTERNATIONAL (I.M.O.)
PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)
.

Calcium Chloride

CHEMICALS FROM BRINE

Various natural brines and artificially produced brines inside salt deposits are important commercial sources of basic industrial chemicals. These chemicals are recovered directly from brines produced by solution mining as well as natural brines (1–2). The brine industry includes the secondary products processed in the same plant as the brine (see p. 388).

The raw material sources include seawater, inland lake as well as subterranean brines, and potash (sylvite) and numerous salt (NaCl) deposits including salt domes and bedded salt. The alternative to these sources are dry-mined evaporite deposits. Raw materials needed for processing are several forms of limestone, dolomite, lime, ammonia, and sulfuric acid, all of which may be produced captively in some cases. The industry is generally energy-intensive to the extent that electrical energy is considered a raw material for several of the large-tonnage products. Electrical power is generated on-site at a number of locations (see Alkali and chlorine products).

Occurrence

Boron Compounds. The saturated liquors pumped from two brine bodies of Searles Lake, California, are the sole commercial domestic brine source of boron compounds yielding almost one-fifth of the boron compounds produced in the United States (3). Possible future commercial brine sources are the geothermal brine wells near the Salton Sea, or even the waters of Great Salt Lake (4) (see Boron compounds).

Bromine. Bromine occurs in the form of bromide ion dissolved in seawater, and to a much lesser extent in underground brines and deposits of marine origin (5). A minute fraction is contained in terrestrial brines (see Bromine).

The earliest commercial production of bromine in the United States, in the mid-1800s, made use of a well-brine at Freeport, Pa. (6). Later, the recovery of bromine from the well-brines of Midland County, Michigan, was developed. Production from natural brines in Michigan, Ohio, and West Virginia supplied the major portion of the United States needs until 1935, and Michigan brines are still one of the principal sources. Minor amounts of bromine are also produced directly from one of the concentrated plant liquors of the KCl recovery process at Searles Lake.

Calcium Chloride. Brines are the sole commercial source of calcium chloride, but are surpassed by limestone as a source of other calcium compounds (see Calcium compounds, calcium chloride).

Natural brines containing a relatively high concentration of calcium ion (>4%) are encountered mainly in Michigan, Ohio, West Virginia, Utah, and California (7), but are, at present, commercially exploited for calcium chloride only in Michigan and California. The California brines occur in near-surface reservoirs resulting from closed-basin drainage. At all other locations mentioned, the brines are of marine origin and occur in much deeper-lying formations.

A secondary, yet commercially important source of calcium chloride is the waste brine resulting from the production of soda ash by the Solvay process that contains 8–9% $CaCl_2$ (8) (see Alkali and chlorine products).

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: CALCIUM CHLORIDE, DIHYDRATE
FORMULA: CACL2 2H2O
FORMULA WT:147.02
CAS NO.: 10035-04-8
NIOSH/RTECS NO.: EV0177000
PRODUCT CODES: 1332,1336,1337
EFFECTIVE: 10/22/86
REVISION #02
PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM
HEALTH - 1 SLIGHT
FLAMMABILITY - 0 NONE
REACTIVITY - 0 NONE
CONTACT - 2 MODERATE
HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).
LABORATORY PROTECTIVE EQUIPMENT
SAFETY GLASSES; LAB COAT
PRECAUTIONARY LABEL STATEMENTS
WARNING
HARMFUL IF INHALED
CAUSES EYE IRRITATION
DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.
SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

2 - HAZARDOUS COMPONENTS

COMPONENT%	CAS NO.
CALCIUM CHLORIDE, DIHYDRATE 90-100	10035-04-8

3 - PHYSICAL DATA

BOILING POINT: N/AVAPOR PRESSURE(MM HG): N/A
MELTING POINT: 176 C (349 F) VAPOR DENSITY(AIR=1): N/A
SPECIFIC GRAVITY: 0.84 EVAPORATION RATE: N/A
(H2O=1) (BUTYL ACETATE=1)